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AMERICAN

JOURNAL OF PHILOLOGY

VOL. IV, 2. WHOLE NO. 14.

I.—STICHOMETRY.

Introduction.

The following investigations have been undertaken in the hope of obtaining some critical conclusions with regard to the extent of early documents, chiefly Biblical, from the apparently insignificant, yet highly important data furnished by certain numbers appended by ancient scribes to the books which they copied. It is only lately that I have come to regard, with any other feeling than complacent pity, the labors of those Masoretic editors of the Hebrew Bible who so carefully inform us as to the number of verses and the points of bisection of the separate books; the natural impulse of one's mind being towards the conclusion that such work might perhaps be agreeable at some period of involuntary incarceration accompanied by a most plentiful lack of books. The Masoretes themselves, however, seem to have been sensible of the importance as well as of the arduous nature of the work of book-measuring, since they preface their annotations with the word חֱזֹק, which is generally understood to be an encouragement (*fortis esto*) either to themselves or their readers. How much more strongly would they have expressed themselves if their task had been, like ours, the inverse problem of restoring the ancient books from their accredited measurements! Doubtless their sympathy would have flowed (after the approved Rabbinic fashion, which I remember to have noted somewhere), in votive offerings of midnight oil for the labors of the devoted calculator.

Nature of Stichometric data.

The first part of this enquiry is retrospective, and consists in the accumulation and estimation of the principal results arrived at by modern philologists, with regard to the form of the early books and the manner of the ancient scribes; and these conclusions are presented as far as possible in an orderly form. The stichometric data which we obtain from MSS, or from early quotations of various writers, chiefly Greek and Latin, are frequently nothing more than pure numbers, sometimes followed by the word στίχοι, or an abbreviation of the same, and sometimes accompanied by additional information as to the number of leaves (φύλλα) or of columns (σελίδες) which were transcribed. For example, the MS N—103 of the National Library at Madrid informs us, at the close of the 5th book of Oppian's Halieutics, that the book contained $\overset{\lambda\lambda}{\phi\upsilon}\ \overline{\iota\delta}\ \overset{\chi}{\sigma\tau\iota}\ \overline{\chi o\eta}$, and similar annotations are found at the close of each of the separate books; *i. e.* the 5th book contains 14 leaves and 678 verses, results which Iriarte (Reg. Bibl. Matritensis, Cod. Gr. p. 408) could not harmonize with the MS or the text. The inference is that the archetypal copy whose numeration and pagination have been transmitted was composed of 14 leaves, each of which contained 50 verses, with the exception of the last, which had only 28 verses.

Their Antiquity.

That stichometric measurements are of great antiquity will appear from the following considerations: M. Weil has recently published fragments of Euripides from a papyrus[1] of the second century before Christ, the first of which comprises 44 lines of an unknown play, and at the close the words Στίχοι ΜΔ. The importance of this document for our purpose is evident; it not only establishes the antiquity of the custom of counting and appending the number of lines of a poem or portion of a poem, but the enumeration is made in the ordinary Greek manner.

Similar annotations are found on the margin of the Papyrus Bankesianus of the Iliad.

The Herculanean rolls provide us with abundant instances of the same usage; here we find prose writings enumerated in a manner similar to poems, and frequently the older form of Greek numeration presents itself, as, for instance, n. 1027 (ed. Oxon.) has the subscription

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[1] Un papyrus inédit de la bibliothèque de Firmin-Didot. Paris, 1879, p. 6.

ΚΑΡΝΕΙΣΚΟΥ ΦΙΛΙΣΤΑ B̄. ΑΡΙΘ. ΧΧΧΗΗΔΔΔΠΙΙΙ,

which implies that a certain portion of the writings of Karniskus contains 3238 verses. What these verses represent in *prose* writings is a problem presently to be considered.

Other instances of the preservation of the more ancient Greek numeration may be seen in the MSS of Herodotus, Cod. Laurentianus LXX 3, and Cod. Angelicanus C 1, 6, and in several important MSS of Demosthenes.

Stichometry earlier than the Alexandrian Library.

It is sufficiently evident that the custom of measuring literary works by *στίχοι* is coeval with literature itself, and instances may be given which establish the continuance of such measurements, both for prose and verse, down to the twelfth century, if not later. It is possible, however, that these more modern subscriptions are to a great extent traditional measurements from an earlier time. Ritschl,[1] in his important researches on the subject of stichometry, came to the conclusion that Callimachus, of the Alexandrian Library, was the inventor of the stichometric method; the chief authority for such a statement is found in the following extracts from Athenaeus:

Τοῦ Χαιρεφῶντος καὶ σύγγραμμα ἀναγράφει Καλλίμαχος ἐν τῷ τῶν παντοδαπῶν πίνακι γράφων οὕτως· Δεῖπνα ὅσα ἔγραψαν· Χαιρεφῶν Κυρηβίωνι· εἶθ' ἑξῆς τὴν ἀρχὴν ὑπέθηκεν· Ἐπειδή μοι πολλάκις ἐπέστειλας· στίχων τοέ. Athen. VI, p. 244 A.

Ἀνέγραψε δὲ αὐτὸν (νόμον τινὰ συσσιτικόν) Καλλίμαχος ἐν τῷ τρίτῳ πίνακι τῶν νόμων, καὶ ἀρχὴν αὐτοῦ τήνδε παρέθετο· Ὅδε ὁ νόμος ἴσος ἐγράφη καὶ ὅμοιος· στίχων τριακοσίων εἴκοσι τριῶν. Athen. XIII, p. 585 B.

It will be evident, however, that these quotations really imply nothing more than a general statement that Callimachus entered books under certain catalogues, in which were found, with the name of the author and the title of the book, the first line of its contents, and the number of lines. And M. Graux[2] has pointed out that we have evidence anterior to Callimachus of the existence of prose works measured by their author in ἔπη, which is practically an interchangeable term with *στίχοι.* The reference is to Photius, cod. 176, p. 120, where, discussing the writings of Theopompus, we find *οὐκ ἐλαττόνων μὲν ἢ δισμυρίων ἐπῶν τοὺς ἐπιδεικτικοὺς τῶν λόγων συγγραψαμένῳ, πλείους δὲ ἢ ιέ μυριάδας ἐν οἷς τάς τε τῶν Ἑλλήνων καὶ βαρβάρων πράξεις μέχρι νῦν ἀπαγγελλομένας ἔστι λαβεῖν . . . ταῦτα αὐτὸς περὶ αὐτοῦ λέγων κτέ.* Here then we have the personal statement of a writer, nearly a century previous to Callimachus, as to the stichometric measurement of the extent of his books. We shall frequently have occasion to refer to the researches of Ritschl and Graux, which are the basis of all modern investigations on stichometry.

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[1] Opusc. Philolog. I, p. 84.

[2] Revue de Philologie, April, 1878, p. 97.

Existence of a sensibly constant στίχος.

Assuming, then, the fact of such measurements, by means of which the separate works of a writer are determined, added together, and compared with works of other writers, we ask how such measurements and comparisons were possible, unless there were somewhere an approximately constant element or standard of reference.

We might, indeed, compare the works of Homer with the tragedies of Sophocles, because the mention of the number of lines in each case is, with the exception of the choruses, made in terms of two constant units, the hexameter and the iambic trimeter, and the mind is perfectly capable of reducing one of them to the equivalent proportion of the other. But what possible light is thrown upon the comparative lengths, for instance, of a book of the Iliad, and the Antiquities of Josephus, when we are told by that writer that his work contains 60,000 *στίχοι*, and have no access to the MS in which he measured them?

It becomes interesting, therefore, to examine whether the word *στίχος* is ever deflected from its simple and indefinite meaning of line or verse into any special meaning which may identify it as a standard of length, suitable for times when the uniformity of printed editions was unknown.

Normal meaning of στίχος.

As we have said, its normal meaning is simply row, line, or verse. For example, the rows of stones in the breastplate of the high priest are by the LXX called *στίχοι. Στίχος λίθων ἔσται· σάρδιον, τοπάζιον καὶ σμάραγδος ὁ στίχος ὁ εἷς* (Ex. XXVIII 17), which the Vulgate renders by in primo *versu* erit lapis sardius, etc. In a military sense the *στίχος* is used of either a rank or file of soldiers, but more properly belongs to the latter. Thus we find in Montfaucon, Bibl. Coislin., cod. 347, some fragments of a little work De Tacticis, and here *στίχος καὶ δεκανία καὶ λόχος τὸ αὐτό ἐστιν· βάθος ἐστὶ φάλαγγος τὸ μὲν τὸ μέτωπον ἅπαν καὶ ὁ ἀπὸ λοχαγοῦ ἐπὶ οὐραγὸν στίχος καὶ βάθος λέγεται*, and the definition of *λόχος* contains the following interesting statement, showing that the fondness for particular numerical arrangements was gratified on every opportunity: *ἔνιοι μὲν τὸ σύστημα τὸ ἐξ ἀνδρῶν ὀκτὼ οἱ δὲ τὸ ἐξ ἀνδρῶν δώδεκα, οἱ δὲ τὸ ἐκ δεκαὲξ ἀνδρῶν πλῆθος ὃ καὶ τελειόν φασι καὶ σύμμετρον.* We see that a preference is shown in arranging the men for the numbers 8, 10, 12, and 16.

Precisely similar statements are found in Ælian, Tactic. IV, from which we may take the following:

> *Ὁ δὲ λόχος ἐστὶν ἀριθμὸς ἀνδρῶν ἀπό τινος ἡγουμένου καὶ τῶν μετ' αὐτὸν ὄπισθεν ἑπομένων μέχρι τοῦ τελευταίου· τὸν δὲ ἀριθμὸν τοῦ λόχου οἱ μὲν ὀκτὼ ἀνδρῶν ἐποίησαν, οἱ δὲ δώδεκα, οἱ δὲ δεκαέξ· ἔστω δὲ νῦν ἑκκαίδεκα ἀνδρῶν ὁ λόχος· συμμέτρως γὰρ ἔχει πρός τε τὸ μῆκος τῆς φάλαγγος· ὁ λόχος δὲ ὅλος καλεῖται στίχος, ὀνομάζεται δὲ καὶ δεκανία, ὑπο δέ τινων ἐνωμοτία.*

Στίχος *a measure of syllables rather than words.*

We shall then not be surprised if we find that the scribes, in arranging or in measuring their lines, show a preference for particular numbers; and any such plan of fixing the length of the line must evidently be by the enumeration, either of the letters, syllables, or words which the line contains. The last of these suppositions may be rejected almost at once; the continuous writing of early times pays little regard to words, which are broken up by the line-endings with the greatest freedom. On the other hand, the very greatest respect is paid to the division of syllables; it is true that this is somewhat obscured by the fact that the ancient division of syllables is different from the modern English method; but if we observe that the ancient syllable, in Greek manuscripts, ends with a vowel or weak letter, we can easily trace in most of the early MSS a complete system of syllable-section; and this respect paid to the syllable is a transcriptional phenomenon of great importance.[1]

In fact, in many cases where we should speak of words, the ancient writer uses syllables ; for instance, Galen[1] de placit. Hippocr. et Plat. VIII 1, ἐγὼ δείξω σοι δι᾽ ὀλίγων συλλαβῶν, where we should say "I will show you in a few *words*." And Hermas Vis. II 1, μετεγραψάμην πάντα πρὸς γράμμα· οὐχ ηὕρισκον γὰρ τὰς συλλαβάς, where again we should say "I copied the whole, letter for letter, for I could not separate the *words*."

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[1] Cf. Kühner, Grammar I 273, and Westcott and Hort, Introd. to N. T. 315.

The same preference for syllabic measurements may be seen in the following fragments of Longinus[2] on the nature of metre and verse: τοῦ δὲ περὶ μέτρων λόγου πολλοὶ πολλαχῶς ἤρξαντο· οἱ μὲν ἀπὸ στοιχείων, ὡς Φιλόξενος, οἱ δὲ ἀπὸ τοῦ μέτρων ὅρου, ὡς Ἡλιόδωρος, ἡμεῖς δὲ Ἡφαιστίωνι κατακολουθήσομεν, ἀπὸ συλλαβῆς ἀρξάμενοι. And again, χρόνος γὰρ συλλαβὴν ποιεῖ, συλλαβὴ δὲ πόδα, ποὺς δὲ συζυγίαν, συζυγία δὲ στίχον, στίχος δὲ ποίημα, so that the basis of Hephaestion's theory of verse, which Longinus approves, is the syllable. We shall not, therefore, be surprised to find the same prominence given to the syllable in prose measurements. When we refer to Hephaestion himself (περὶ ποιήματος ch. 1, p. 65, Westphal) we find that στίχος ἐστὶ ποσὸν μέγεθος μέτρου, ὅπερ οὔτε ἔλαττόν ἐστι τριῶν συζυγιῶν οὔτε μεῖζον τεσσάρων, or the στίχος is declared to lie between three and four συζυγίαι, which Longinus explains to be διποδίαι.

Thus the στίχος of Hephaestion ranges between 6 and 8 feet ; and although his definitions refer to poetry, we shall probably be able to trace some similar manner of division for prose lines.

Actual case of numbered syllables.

In order to establish this point, we return to the passage of Galen previously alluded to, and transcribe it more at length: οὕτως γοῦν ὁ ἀληθὴς λόγος ἐστὶ βραχύς, ὡς ἐγὼ δείξω σοι δι᾽ ὀλίγων συλλαβῶν περαινόμενον ὄντα τοιοῦτον. 'ἔνθα τῶν νεύρων ἡ ἀρχὴ, ἐνταῦθα τὸ ἡγεμονικόν. ἡ δ᾽ ἀρχὴ τῶν νεύρων ἐν ἐγκεφάλῳ· ἐνταῦθα ἄρα τὸ ἡγεμονικόν' εἷς μὲν οὗτος ὁ λόγος ἐννέα καὶ τριάκοντα συλλαβῶν ὅπερ ἐστὶ δυοῖν καὶ ἡμισέως ἐπῶν ἑξαμέτρων. ἕτερος δ᾽ ἐστὶ πέντε τῶν πάντων ἐπῶν. 'ἔνθα τὰ πάθη τῆς ψυχῆς ἐπιφανέστερα κινεῖ τὰ μόρια τοῦ σώματος, ἐνταῦθα τὸ παθητικὸν τῆς ψυχῆς ἐστιν· ἀλλὰ μὴν ἡ καρδία φαίνεται μεγάλην ἐξαλλαγὴν ἔχουσα τῆς κινήσεως ἐν θυμοῖς καὶ φόβοις· ἐν ταύτῃ ἄρα τὸ παθητικὸν τῆς ψυχῆς ἐστιν.' εἰ δὲ συνθείης ὡδὶ τούτους τοὺς δύο λόγους οὐ πλεῖον τῶν ὀκτὼ ἑξαμέτρων τὸ συγκείμενον ἐξ αὐτῶν πλῆθος ἔσται. τίνες οὖν αἴτιοι τοῦ πέντε βιβλίοις γραφῆναι περὶ τούτων ἃ διὰ ὀκτὼ στίχων ἡρωϊκῶν ἐπιστημονικὴν ἀπόδειξιν εἶχεν ;

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[1] Kühn, V 155.

[2] Longinus, ed. Egger, p. 69.

Στίχος *identified with hexameter of 16 syllables.*

According to Galen then, 39 syllables of prose writing are equivalent to 2½ hexameters; 83 syllables represent 5 hexameters; the two quotations together, 122 syllables, do not amount to more than eight hexameters. From which it is obvious that the prose hexameter of Galen is 16 syllables; and we observe further that this line-unit is dignified with the alternative titles of ἔπος ἑξάμετρον, ἔπος, and στίχος ἡρωϊκός. The peculiarity in the use of these words seems to consist in the extension of the meaning of ἔπος which is implied in the use of an adjective, from its normal meaning of a heroic or hexameter line to the more general application which includes any written line whatever; while, on the other hand, the term στίχος, which normally represents any written line whatever, undergoes a contraction of meaning until we frequently find it used synonymously with hexameter, even to the exclusion of lines of other lengths. A curious instance of this may be seen in a tenth-century MS, written on Mount Athos, and described in Montfaucon, Bibl. Coislin., p. 597. Here we find στίχος used of hexameter verses, in distinction from iambics.

περὶ ποιητῶν.
ὅσοι διὰ στίχων καὶ ἰάμβων ἔφρασαν·
Ὅμηρος στίχους, Ἀπολλώνιος στίχους, Θεόκριτος ὁμοίως,
Ἄρατος ὁμοίως, Νίκανδρος ὁμοίως, Μένανδρος ἰάμβους κτέ.

So far, then, everything tends to the assumption that the στίχος is equivalent to the average hexameter, a conclusion which will be abundantly verified by an actual reference to texts and documents. It also seems that there is a preference shown for measuring the average hexameter by syllables, probably sixteen in number. The number of syllables in a hexameter is an instance of variation between fixed limits (cf. the definition quoted from Hephaestion); but the number sixteen invites especial attention, as being that suggested by the first line of Homer, and also on account of its symmetrical or square character, which, as we have already seen, gave it a preference in the determination of the conventional number of ranks in a phalanx of soldiers, and which was always an important feature in the eyes of those who saw special Pythagorean virtues in numbers.

Alternative of a letter-line.

On the other hand we must enquire whether there is any ground for asserting the existence of a letter-line in preference to a syllable-line; for it may be assumed, I think, with safety that the art of transcription undergoes a double development: first, it changes from letter-by-letter writing to a writing syllable-by-syllable, and from this, for greater ease in reading, to a transcription word-by-word; so that the lines for successive periods of time would end, in the first case with the geometrical limit of the line, in the second and third cases with the most convenient syllable or word. And this change is evidently in the direction from a very regular line, such as those found in many early inscriptions, to one not quite so regular, such as occurs in early vellum MSS, and so to the somewhat irregular later writing. We should expect then to find some traces of the measurement of the actual number of letters in a line. The following are the only instances with which I am acquainted.

On the back of an astronomical work of Eudoxus,[1] dating from the second century before Christ, are twelve verses forming the acrostic ΕΥΔΟΞΟΥ ΤΕΧΝΗ; these are arranged so that each of the letters is a day, each of the lines represents a month, and the whole poem a year of 365 days: according to the verse *ὁ μὲν στίχος μείς ἐστι, γράμμα δ᾽ ἡμέρα.*[2] Another instance is given by Birt[3] from Pappus Alexandrinus (II 17, 4; II 23) in which the verse:

Ἀρτέμιδος κλεῖτε κράτος ἔξοχον ἐννέα κοῦραι

is reckoned at 38 letters (*ἐπεὶ οὖν γράμματά ἐστιν λή τοῦ στίχου*).

Neither of these instances bears very exactly upon our enquiry; they show, however, traces of a method of measurement which must have been common in early times, when the letter, rather than the syllable, was the basis of metre and prose alike. It is almost a self-evident principle that a MS written on the basis of the letter will be reckoned by the number of its letters, and a MS written with reference to the syllable will be numbered by its syllables.

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[1] Wattenbach, Gr. Palaeographie, p. 7.

[2] Birt, Buchwesen, p. 161.

[3] Birt, p. 160.

Actual Calculation of the Length of Lines for Various Authors.

We shall now confirm these results by the examination of actual data supplied by MSS and authors, following closely the results of M. Graux, with such changes as may be necessary in the arrangement of the matter, and some additions and corrections. Where the results deduced for the value of the στίχος are given in letters, we have only to remember that the average hexameter, taken by M. Graux from 50 lines of the Iliad opened at random, is 37.7 letters; and where the result is given in syllables, the average is 15.6 syllables, as deduced by Diels[1] from the first fifty lines of the Iliad. In every case we must divide the estimated letters or syllables of a book by the number of traditional lines. We begin with Herodotus; stichometric notes are found in Laurentianus LXX 3, and Angelicanus C 1, 6, to books IV, V, VIII, IX.

M. Graux gives as follows:

		Lines.	*Letters to line.*
Book IV	XXXHH𐅄III	3253	37.6
V	XXHH	2200	37.5
VIII	XXHHHΔΔII	2322	37.6
IX	XXHHΠI	2206	37

Diels measures the syllables, giving:

	Total lines.	*Total syllables.*	*Syllables to line.*
Book IV	3253	48940	15.08
IX	2206	32640	14.8

For Thucydides we have the following from Dionysius of Halicarnassus (Judic. de Thucyd. c. 10):

Book I, c. 1–87	δισχίλιοι	2000	35
I, c. 1–23	πεντακόσιοι	500	35

Diels estimates the syllables for the second passage to be 7740 and deduces a normal line of 15.5 syllables. There are several other stichometric notes in Dionysius to other passages of Thucydides, for which M. Graux did not quote the results, because they seemed to diverge from the preceding. The difficulty in such cases is that the numbers are approximate and the passages not clearly defined. They will be found, according to Birt (p. 198), to give results agreeing closely with a line of 35 letters.

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[1] Diels, Hermes, XVII Bd., 3 Heft.

In Isocrates we have a single subscription from Codex Urbinas, together with some other marks to be discussed later on. This gives us:

		Lines.	*Letter line.*
Busiris	HHH𐅄ΔΔΔΔ	390	37.4

Diels gives 6070 syllables and deduces 15.5 syllables to the line, which is sufficiently near, though his estimate is in reality in excess by 30 syllables. Fuhr repeated M. Graux's calculation and made 37.66 letters to the *στίχος*.[1] With the same datum corrected to 395, as suggested by Fuhr, we have a line of 15.2 syllables.

For Demosthenes we have a valuable collection of data from Graux and W. Christ,[2] which may be exhibited in one table, with the corresponding MS authority and the deduced value of the *στίχος*. The notation of the MSS is based on that of Vömel, and no account is taken of documents inserted in the text. Obvious errors are corrected.

	MSS.	*Data.*	*Corrected lines.*	*Letter line.*
1 Olynth.	Σ BF.	HH𐅄ΔΠ	265	34.8
2 Olynth.	Σ BFA3	HH𐅄ΔΔΔΔΠ HHΔΔΔΔΠ	295	35.3
3 Olynth.	Σ BF.	HHHΔΔΠ	325	36.6
1 Philipp.	Σ BF.	HHHH𐅄Δ	455	36.4
Peace	Σ BF.	HHΠI	206	35.7
2 Philipp.	Σ BF.	HH𐅄ΔΔΔΔ	290	35
Halonnesus	Σ BF.	HHHΔΔΔΔΠ	345	36.7
Chersonesus	Σ BFA3.	𐅅𐅄ΔΔΔΔ	590	37.3
3 Philipp.	A3 Σ BF.	𐅅𐅄ΔΔΔΔ 𐅅𐅄ΔΔΔ	580	36.3
4 Philipp.	B. A3 Σ	𐅅HΔΔΔHH 𐅅HΔΔΔH 𐅅HΔΔΔIIII	634	35.8
Letter of Philip	Σ BFA3.	H𐅄ΔΔΔΔΠI	196	35.1
Περὶ συντάξεως	Σ BF.	HHHΔΔΔ	330	35.8
Περὶ τῶν Συμμοριῶν	Σ BF.	HHH𐅄ΔΔΔΔ	390	34
Liberty of Rhodians,	Σ BF. Corr.	HHHΔΔΔΔΠII HHHΔΔΔIIII	334	34.5
Megalopolitans	Σ BF. Corr.	HH𐅄ΔΔΔΔIIIH HH𐅄ΔΔΔΠIIII	288	33.9
Treaty with Alexander,	Vat. Corr.	HHHΔΔΔHII HH𐅄ΔΔΠII	277	34.6

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[1] Rhein. Mus. Bd. 37, Heft 3, p. 468.

[2] Die Atticusausgabe des Demosthenes.

	MSS.	*Data.*	*Corrected lines.*	*Letter line.*
Crown	BF. Σ	XX𐅅HH𐅄ΔHIII XX𐅅HH𐅄ΔΠIII	2768	35·8
De fals. leg.	Σ BF.	XXXHH𐅄ΔΔΔ	3280	35·9
Leptines	Σ BF.	X𐅅HΠIII	1608	35·6
Midias	Σ BF. Corr.	XXIII XXHI	2101	35·6
Androtion	Σ	𐅅HH𐅄ΔΔΔ	780	35·3
Aphobos I	Σ BF. Corr.	𐅅HΠΔΔΔ 𐅅H𐅄ΔΔ	670	35·1
Aphobos II	Σ	HHΔΔΔΔ	240	33·8
Adv. Onet.	Σ BF.	HΔΔΔΔ	140	33·9
Lacritos	Σ BF.	HHHHΔΔΔ	430	35·8
Nausimachos	Σ F.	HH𐅄ΔΔ	270	34·4
Boeotos I	Σ	HHH𐅄ΔΔΔ	380	35·1
Boeotos II	Σ	𐅅𐅄ΔΔ	570	34·8
Macartatos	Σ	𐅅H𐅄ΔΔ	670	35·2
Leochares	Σ	𐅅HΔΔΔΔ	640	34·5
Stephanos I	Σ	𐅅HH𐅄ΔΔΔΔIII	793	34·6
Corona Trierarch	Σ Corr.	HHΠH HHΠII	252	34·4
Callippos	Σ	HHHΔΔIII	323	33·5
Nicostratos	Σ Corr.	HHΠI HHHΠI	306	35·1
Conon	Σ	HHHH𐅄Δ	460	35·7
Eubulides	Σ Corr.	𐅅𐅄ΔΔΔΔ 𐅅H𐅄ΔΔΔΔ	690	34·3
Neaera	Σ Corr.	XHHH𐅄I XHH𐅄I	1251	35·5
Epitaph.	Σ Corr.	HHHHIIII HHH𐅄ΠII	357	36·9
Eroticos	Σ Corr.	𐅅𐅅ΔΔ 𐅅𐅄Δ	560	34·4
Prooemia	Σ	XHHH𐅄ΔΔ	1370	35·6
Epistle I	Σ Corr.	NΔΔΔΠ HΔΔΔΠ	135	35·1
Epistle II	Σ	HHΔΠII	217	34·7
Epistle III	Σ Corr.	𐅅HHH𐅄ΔΔ HHH𐅄ΔΔ	370	35
Epistle IV	Σ	HI	101	34·4
Epistle V	Σ	ΔΔΔΔ	40	36·5

The majority of the corrections in the previous table (due to Blass, Sauppe, and Graux) are sufficiently obvious. The results exhibit a remarkable constancy, though they are slightly in defect of the full average hexameter.

On the application of these data to the study of the genealogy of the MSS of Demosthenes, we must refer to W. Christ's valuable paper, previously alluded to.

Reserving the question of Biblical and Euthalian stichometry for later consideration, we have the following further references from M. Graux.

For Eusebius: Praeparatio Evangelica; from the MS Paris 451:

		Lines.	*Letter line.*
Lib. I	ΑΦΗΓ = ΑΦΝΓ	= 1553	37.2
Lib. II.	ΑΥΠΓ	= 1483	37.2
Lib. III.	ΑΩΝΗ	= 1858	36.1

For Gregory of Nazianzus; from the MS Laur. VII 8:

Homily I	ΡΗ	36	Homily XXIII	ΤΜΒ	35.4
II	ΑΩϘϚ	35.4	XXIV	ΥϘΕ	36.2
III	ΡΜΒ	37	XXV	ΦΞΘ	36
IV	ΒΥΝΗ	36.6	XXVI	ΦΚΓ	36.4
V	ΑΜΒ	36.7	XXVII	ϹΙ = ϹΟ	36.7
VI	ΧΚΕ	36	XXVIII	ΦΝΘ = ϠΝΘ	36
VII	ΨΙΗ	35	XXIX	ΦϘ	37
VIII	ΦΞΘ	35.9	XXX	Φ = Χ	36.5
IX	ΡΜΘ	37.4	XXXI	ΨΟΕ	36.5
X	Ρ	35.9	XXXII	ΩΙΑ	36.9
XI	ϹΘ	36	XXXIII	ΥΜ	36.6
XII	ΡΝ	37.7	XXXIV	ϘΘ = ϹϘΘ	36
XIV	ΑΙΖ = ΑΡΖ	36.2	XXXVI	ΤΛΓ	35.5
XV	ΥΛ	36.8	XXXVIII	ΥΝΕ	36.6
XVI	ΧΚϚ	35.3	XXXIX	ΦΝ = ΦΗ	36.6
XVII	ΤΛΕ	36.8	XL	ΑΥΙΘ	36
XVIII	ΑϹΛΗ	35.8	XLI	ΥΠΑ	37.2
XIX	ΥΙΖ	36.5	XLII	ΨΛΒ	36
XX	ΤΑ	36.6	XLIII	ΒΥ	35
XXI	ΑΡΞΑ = ϠΞΑ	35.6	XLIV	ϹϘΕ	35.6
XXII	ΥΛΗ	36.8	XLV	ΩΠΓ	35.9

And for the letters of Gregory from the same source:

Ep. CI	TM	36
Ep. CII	Ρ = ΡΞ	36.9

It must be sufficiently patent from the foregoing researches of M. Graux that every speculation as to the equality between the στίχος and the average hexameter is abundantly confirmed. The only thing that does not appear from the results is whether the lines are measured by their letters or their syllables; but this has been already discussed, and we have arrived at a high probability in favor of syllabic measurements, at least in the case of later authors.

Alternative στίχος *of twelve syllables.*

The next question that arises is whether there are traces of any other normal lines; and in the first place, are there any instances of lines measured by iambic trimeters, or lines whose normal extent is 12 syllables? Now if we measure this line by letters, we at once find from 25 lines of the Medea of Euripides 29.96 letters; and this number 29.96 is extremely suggestive when we examine the following passage from Josephus, at the close of the Jewish Antiquities: ἐπὶ τούτοις τε καταπαύσω τὴν ἀρχαιολογίαν, βίβλοις μὲν εἴκοσι περιειλημμένην, ἓξ δὲ μυριάσι στίχων.

If we take the assertion of Josephus literally, remarks M. Graux, we should find for the value of the στίχος *the inadmissible quantity 28 or 29 letters.* The statement is then explained to be a rough expansion of the assertion that each of the 20 books of the Antiquities contained 2000 or 3000 στίχοι. And Birt (Buchwesen, p. 204) suggests the alternative reading έ for ἓξ by which the Josephus line will be 34.2 letters. Obviously the lines are really iambic lines: and this is confirmed in several ways by other considerations which I have adduced elsewhere.[1] It will also be more apparent as we proceed with our subject.

The importance of the result is mainly this, that it establishes the habit of writing iambic lines, at least so far as regards the first century and the locality of Syria, a conclusion which may affect our views as to the character of the originals of the New Testament.

[1] Amer. Journ. Phil. 12, Suppl.

Alternative of a longer line.

Diels[1] believes that he has also found traces of a line even longer than the hexameter. He bases this belief on quotations which Galen makes from Hippocrates. From these we have:[2]

Hippocrates (ed. Kühn).	*Στίχοι.*	*Syllables.*	*Syllables to line.*	*Letters to line.*
I. 348—360, 18	240	4360	18	40.8
I. 348—371, + 616—625, 9	less than 600	11420	19	42.7
I. 624, 17—625, 9	about 10	212	21.2	49

Moreover, in another place, Galen (V 716, Kühn) reckons 86 syllables of Plato, Tim. p. 70 D, as 4 *στίχοι*.

The difficulty of admitting these results is considerable; for we have already shown that Galen employs a sixteen-syllabled line for measuring *στίχοι*, and it is difficult to see how he should have varied his standard for another so nearly coincident with it as 18 syllables would be. Moreover, Diels has shown, with high probability, by very appropriate quotations, that not only did Galen use a line of 16 syllables as his unit, but that the early copies of his works were written in an exemplar of that very length. This he establishes by the following quotations and measurements:

Oribasius III 662, 3 (ed. Daremberg et Bussemaker) *γίνεται δέ ποτε κτέ.* From Galen, Meth. Med. XIV (X 1009, 4 sqq. Kühn), on which the Scholiast remarks (p. 689, 12) *ἀπὸ τοῦ ι̅δ̅ τῆς θεραπευτικῆς ὡς πρὸ σ̅ν̅ στίχους* (l. *στίχων*) *τοῦ τέλους, κεφ. περὶ ἕρπητος.* Three similar quotations are given from the same source,[3] and finally we have:

		Normal	
Galen (ed. Kühn).	*Στίχοι.*	*Syllables.*	*Letters.*
X. 1007, 4—1021, 19	ca. 250	16.6	39.6
X. 445, 7—455, 12	ca. 200	15.9	41.2
X. 448, 4—455, 12	ca. 140	16.5	42.9
VII. 705, 1—717, 1	ca. 200	16	41

Galen, therefore, measures and perhaps even writes 16-syllabled lines; and the only conclusion we can come to is that his copy of Hippocrates must have been slightly in excess of the ordinary pattern, rather than that it was written on a new pattern.

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[1] Hermes, Bd. XVII, Heft 3.

[2] Galen, ed. Kühn, XV 9, 10.

[3] Oribasius, IV 179, 4; IV 181, 2; III 598, 11.

Subdivision of lines in MSS.

The existence of the normal hexameter and iambic lines is, however, so little obvious from surviving MSS themselves, that an objection arises against the previous investigations on the ground of want of actual paleographic evidence. Perhaps the deficiency on this point is due to two causes. First of all, the cataloguing of an exactly written library edition, such as would be found in the library at Alexandria, rendered the preservation of the stichometric form unnecessary and prepared the way for the breaking up of that form; and in the next place, the breadth of the columns of the papyrus-rolls did not generally admit that the lines should be written in full, and they were consequently subdivided into two, three, or more narrow lines. Conspicuous instances are furnished by the celebrated Vatican and Sinaitic codices of the Bible; of which the lines represent respectively a somewhat curtate half-hexameter and a similarly divided iambic trimeter. This I have shown to be the case in the two MSS in question by the actual examination of the text for the accidental hexameter in James I 17 and for a quoted iambic verse in 1 Cor. XV 34.[1] The supposition is confirmed by Baehrens,[2] in some good remarks on the Ancient Book-Form of Roman poets. And Baehrens points out that these subdivided lines may actually be seen in a papyrus roll represented on a Pompeian painting, where four lines are found divided into sixteen. This, however, may be nothing more than artistic license. In Montfaucon, Bibl. Coislin., for example, the Gospel of John is pictorially represented as being written by its author in lines of about a syllable each. The most likely place to find these subdivided lines is in epistles, which seem to have been written on shorter models.

Partial Stichometry.

A further development of the simple stichometric subscription is found in those MSS which inform us, by means of marginal notes from point to point, as to the number of *στίχοι* contained in the preceding portion of the book. And exactly similar statements are found in many early writers, who cite books by the number of *στίχοι* precisely as we quote page and line. To these annotations Schanz has given the name of Partial Stichometry.

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[1] American Journal of Philology, 12, Suppl. p. 18.

[2] Neue Jahrbücher für Philologie, Elftes Heft, 1882, p. 785: "aber dafür gab es nur eine möglichkeit, nemlich indem man die seiten schmäler machte; und dies führte wiederum notwendig dazu dass man grössere verse (hexameter u.s.w.) auf zwei oder mehr zeilen vertheilte."

Precisely as in the case of total stichometry, we find that these MS notes have no special connexion with the lines or verses of the documents in which they occur; they refer either to older copies, or to fixed and uniform measurements, perhaps to both.

For Isocrates.

For example, we have already discussed the total stichometry of Isocrates, Busiris, in Codex Urbinas. The MS also contains marginal references, which have been studied by Fuhr.[1] Thus we find fol. 22, 10 (§25), before *τούτων αἴτιοι* the letter B; and before *γεγονότας ἢ τοὺς* the letter Γ; between these two Fuhr counts 3763 letters, which evidently represent 100 *στίχοι*. If this estimate be correct, we ought also to find that the part of the book before B represents 200 verses, the letters on the margin being the conclusions of the several hundreds of hexameters. When the book is measured in sixteen-syllabled *στίχοι*, we have the mark B at the 190th line and Γ at the 287th line; if, however, the lines are a little short so as to average 15.2 syllables, we have B at the 200th line and Γ at the 301st line, which is very exact; and the total book is now 395 verses, which supports Fuhr's emendation. These marks are therefore relics of a stichometry suitable for quotation; as they are not in the archaic numeration which is found at the close, but in the ordinary Greek character, it is right to assume that they are later in date. And we shall probably see reason to conclude that partial stichometry is, in its historical development, always later than total stichometry. In many cases the notation is a transitional one, employing the letters of the alphabet for the successive numbers, but not grounded upon the decimal system as in the later numeration.

There are several other marks on the margin of this MS which have never been explained. At Busiris 10 stands the figure *ς* against the words *ἀπολογίαν ποιήσασθαι*. This represents the 82d line (of the same length as the measured verse), and if we allow a little blank space at the beginning of the document for its title, it may very well be the close of the sixth page of the exemplar copied, each page being 14 hexameters.

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[1] Rhein. Mus. 37 Bd. 3 Heft, 1882, p. 468.

The mark ·⋇· also occurs, three times, once with the previous mark, once at the 345th στίχος, and once at the 368th. These are probably the marks of the διορθωτής or MS corrector, and may refer to simple pauses in the work of revision, or perhaps to pages either of the MS copied or of that used in the process of revision. In the actual case in question, the first pause was at the sixth page of the MS copied; while the proportion of the numbers 345 and 368, which are 15 × 23 and 16 × 23, shows that the other two marks may be the conclusions of the 15th and 16th pages respectively of the *revising* MS.

The Urbinas MS has also other annotations of various kinds, the most prominent being the paragraph mark, a horizontal stroke against the beginning of the line where the pause is to be made. All these marks may be found quoted in Fuhr's article already referred to.

For Plato.

Schanz[1] has discussed a precisely similar question for the Plato manuscripts. He remarks that the Bodleian Plato (Clarkianus) has partial stichometry in the Cratylus and Symposion, the letters running continuously to ψ. Counting the lines of Clarkianus between the successive marks, we have 68, 69, 70, 71, 72, 73, 74, 75; 71 being the most frequent interval. Now this gives us a στίχος of 35.56 letters for the Cratylus, and 34.32 for the Symposion, which are sufficiently in accord with M. Graux's results. Similar stichometric marks are found in another MS of Plato, Venetus 185 (Π of Bekker, D of Schanz.) Here again they are confined to Cratylus and Symposion. Between two following letters lie on the average 68 lines; and the same sections are marked off by the letters as in Clarkianus. An interesting application is made by Schanz to determine the authenticity of a passage in Cratylus 437*d*, where certain words are wanting in MSS B and T. We can at once verify that these words were wanting in the exemplar that supplied the stichometry.

W. Christ has studied in a similar manner the partial stichometry of Demosthenes[2] (Codex Bavaricus), and applied the results to the discussion of the integrity of various works of Demosthenes. The data for this investigation will also be found in the preface to Reiske's edition; though Reiske himself seems to have been ignorant of the meaning of the letters for which he gave the references. It will be sufficiently evident from this brief statement that the partial stichometric notes are even more important than the concluding numerical results for the purpose of the determination of the text as it stood in the early exemplars from which the numbers must have been derived.

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[1] Hermes, XVI 309, 1881.

[2] Die Atticusausgabe des Demosthenes. München, 1882.

Further instances.

The Papyrus Bankesianus has the verses marked by hundred on the margin. So, apparently, the Ambrosian Pentateuch;[1] and many intermediate data for the measurement of the Acts and Epistles will be found in Zacagni's edition of Euthalius. Some instances of quotation by the number of στίχοι are found in Diogenes Laert. VII 33, 187, 188, but they are mostly in round numbers (κατὰ τοὺς διακοσίους στίχους, κατὰ τοὺς ἑξακοσίους, κατὰ τοὺς χιλίους στίχους), and we cannot therefore affirm that in these cases the exemplars employed by Diogenes were provided with intermediate measurements. Wachsmuth[2] has discussed these references more at length with the object of showing the precise nature of the quotations made by Diogenes. He also points out that in the similar quotations which Asconius makes from Cicero, there is no reason to suppose the use of a measured exemplar, the citations made being frequently very loose, such as *circa medium*, *circa tertium*, and the verses being sometimes measured from the end instead of the beginning of the cited work. We have, however, sufficient actual MS evidence to make us certain that the method of citation by στίχοι must have been a common one; indeed, it was the only method available with any approach to accurate quotation.

Sense-lines.

As we have already suggested that the development of the art of transcription proceeds from a foundation of letters to one of syllables, and finally from syllables to words and sentences, it becomes interesting to inquire whether there are instances of word-lines or sentence-lines corresponding to the well-established syllabic line.

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[1] Ceriani. Mon. sacra et prof., III, p. xii. [2] Rhein. Mus. 34 N. F. p. 38, 1879.

If such exist, they will have made their appearance first in those parts of literature where the distinct enunciation of a sentence is most important, with the object of removing the causes which hinder rhythm and vocal effect. That is, it is evident that in works which are publicly recited, an effort will be made to render more easy the task of reading orally a continuous text. This is the case with the works of the great orators, as well as with the church lessons; and we may expect to find in such works a tendency in the direction of sense-lines rather than space-lines. In the first instance this tendency will only be manifested by the introduction of the paragraph mark, as it is found in the Hyperides papyri, the MS of Isocrates, and the early Bible texts. But this paragraph mark, perhaps accompanied by a rude interpunction, is not found by the rhetoricians to be a sufficiently obvious and emphatic division of the text. Sense-lines are therefore introduced. The change seems to be made in the first case with a reservation that the text when broken up shall still represent the same number of lines, or sensibly as many, as the archaic copies. And the natural effect of such a change is that the στίχος undergoes a new deflection in the direction of *sentence*, the sentence being not very different from a hexameter.

The evidence for these statements may be arranged as follows: St. Jerome, at the commencement of his preface to Isaiah, informs his readers as to the nature of the book that he is translating.

"Nemo cum Prophetas versibus viderit esse descriptos metro eos aestimet apud Hebraeos ligari, et aliquid simile habere de Psalmis vel operibus Salomonis: sed *quod in Demosthene et Tullio solet fieri, ut per cola scribantur et commata*, qui utique prosa et non versibus conscripserunt, nos quoque *utilitati legentium* providentes, interpretationem novam *novo scribendi genere* distinximus."[1]

St. Jerome introduces for the convenience of readers a new kind of transcription similar to that which was in vogue for Cicero and Demosthenes; this division of the text is by *cola* and *commata*. From Suidas[2] we find that when the στίχος forms a complete clause it is known as a colon: κῶλον οὖν ὁ ἀπηρτισμένην ἔννοιαν ἔχων στίχος.

From Joann. Sicul. in Hermog. I, 63 (Vol. VI, p. 127, Walz), we find that writing by *cola* and *commata* is the invention of rheto-

[1] Migne, Patrol. Lat. XXVIII, col. 771.

[2] s. v. κῶλον.

ricians in imitation of poetry: *ὥστε ἐπειδὴ ποιητὰς οἱ ῥήτορες μιμοῦνται κῶλον λέγουσι τὸ ἀπὸ ἐννέα συλλαβῶν ὂν μέχρι τῶν ἑπτακαίδεκα· τὸ δὲ πλέον σχοινοτενὲς ὠνόμασται, κόμμα δὲ ἀπὸ μιᾶς μέχρι τῶν ὀκτώ. στίχους δὲ κοινῶς οὗτοι καλοῦσιν ἅπαντες εἰ μόνον ἀπαρτίζοιεν ἔννοιαν.* In this passage it is interesting to observe that the standard of measurement is still the syllable, but, as we should expect, there is no longer a fixed number of syllables to a line, but we have three rough divisions; viz. if the clause be less than eight syllables it is called *κόμμα*, if between eight and seventeen it is called *κῶλον*, and if greater than this, *σχοινοτενές* or a long-drawn-out sentence. Such a long line is actually termed a verse in a quotation given by Vömel[1] from Aquila Romanus de Figuris c. 40: "Ponam . . . Demosthenicum versum; Et non dixi quidem haec . . . persuasi quidem." The passage (De Corona, §179) contains 20 words. We may actually see in operation the process of dividing the text of Demosthenes into *κῶλα*.

In a passage of the rhetorician Castor,[2] of the fifth century, we find the following:

> *Θήσομαι τὸν ὅλον Δημοσθενικὸν λόγον τὸν ἐπιγραφέντα Πρὸς τὴν ἐπιστολὴν Φιλίππου· τοῦτον γὰρ στίξομεν, σὺν θεῷ φάναι, κατὰ κῶλον καταντήσαντες εἰς τὴν ποσότητα τῶν κώλων κατὰ τὸν ἀριθμὸν τὸν ἐγκείμενον ἐν τοῖς ἀρχαίοις βιβλίοις, ὡς ἐμέτρησεν αὐτὸς ὁ Δημοσθενὴς τὸν ἴδιον λόγον.*

Castor proposes, that is, to punctuate a passage of Demosthenes so that the numeration of the broken-up text may agree with the number of verses found in the old copies. Whether he supposes Demosthenes himself to have divided the text in this way, or whether he implies by the word *ἐμέτρησεν* a regular and uniform measure, is not very apparent at first sight; but a little consideration will show that it is not important to decide such a point, for it is sufficiently demonstrated that the stichometry of the MSS of Demosthenes is hexameter stichometry; and it must be the number of such verses that Castor wishes to preserve. Dionysius Halic. De Comp. Verb. XVIII gives explanations of the methods employed in breaking up the text of Demosthenes into cola and periods. For instance, in De Corona the first period is to consist of three cola, as follows:

> *Ἐν δὴ τῷ περὶ τοῦ στεφάνου λόγῳ, τρία μέν ἐστιν ἃ τὴν πρώτην περίοδον συμπληροῖ κῶλα· οἱ δὲ καὶ ταῦτα καταμετροῦντες οἵδε εἰσὶν οἱ ῥυθμοί.*
>
> *Πρῶτον μὲν, ὦ ἄνδρες Ἀθηναῖοι, τοῖς θεοῖς εὔχομαι πᾶσι καὶ πάσαις . . .*

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[1] Rhein. Mus. N. F. II 452.

[2] Walz. Rh. Gr. III 721.

Τοῦ δὲ δευτέρου κώλου τοῦδε.
῞Οσην εὔνοιαν ἔχων ἐγὼ διατελῶ τῇ τε πόλει καὶ πᾶσιν ὑμῖν . . .
Τοῦ δὲ τρίτου κώλου,
Τοῦ τοσαύτην ὑπάρξαι μοι παρ' ὑμῶν εἰς τουτονὶ τὸν ἀγῶνα.

It is evident that this custom of colon-writing introduces a measure of confusion into the subject; the more so because colon-writing is sometimes accompanied by colometry, of which occasional traces may be found, as in Dionysius Hal.[1] who makes the proem to Thucydides up to *οὐ χαλεπῶς ἀπανίσταντο* to be 30 cola, and the beginning of the Aristocratea to be 9 cola. Misled by this peculiar dissection of the text at the hands of the rhetoricians, F. Blass[2] maintained strongly that the ancient *στίχος* was not a space-line but a sense-line. And with remarkable skill, which M. Graux honored with the term *habilété de main*, he proceeded to divide various passages, principally in Demosthenes, into a number of cola, sufficiently nearly in accord with the traditional number of verses.

Besides this, he reasoned that if the *στίχος* were a fixed quantity there ought to be a sensibly uniform ratio between the number of verses and the number of lines occupied in the printed text. This he maintained not to be the case.

In this, however, he seems to have failed almost completely, if we allow for the small margin of variation necessary in the measurement of the lines, and the small variations in the sizes of the Teubner pages to which he referred. A single instance will suffice. Taking the data for Herodotus, Blass gives:

	Στίχοι.	*Teubner Lines.*	*Ratio.*
Lib. IV	3253	2764	.849
Lib. V	2200	1866	.845
Lib. VIII	2322	1952	.840
Lib. IX	2206	1849	.842

If this does not demonstrate the use of a uniform verse-measure for Herodotus, it would be difficult to prove anything.

The merit of Blass' work consists, however, in the light it throws on the early rhetorical studies, and not at all in its bearing on stichometry. Blass himself, after making his colon division, came to the conclusion that the colon could not be very different from the hexameter. "Die Zeilen sind mitunter lang, *aber selten länger als ein Hexameter.*"[1] "*Das rhetorische Colon entspricht dem poetischen Vers.*"[2] This is precisely what we should expect to find, for we have indicated that the colon was introduced as an alternative for the hexameter, and was made as far as possible equivalent to it. Another instance of this tendency, besides those which have been already quoted, is found in Cicero, Orat. 222: "E quattuor igitur (sc. membris) quasi hexametrorum instar versuum quod sit, constat fere plena comprehensio. His igitur singulis versibus quasi nodi apparent continuationis, quos in ambitu coniungimus."

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[1] Dion. Hal. de Comp. pp. 169, 199.

[2] Zur Frage über die Stichometrie. Rhein. Mus. N. F. XXIV, 1869, p. 524.

Herodes Atticus[3] is said to have had a clepsydra made which was the time-equivalent of 100 hexameters, συμμεμετρημένην ἐς ἑκατὸν ἔπη, by means of which his enunciation was regulated.

Scrivener's pay and price of books.

We now turn to the question of the employment of stichometric measurements in determining the pay of scribes and regulating the price of books. For investigations on this point the best researches are those of Graux and Birt.

It is established by means of the celebrated edict of Diocletian (A. D. 301), which was a tariff of maximum prices for the Roman empire, that the pay of scribes was by the hundred lines; and M. Graux very justly remarked that this assumed the fixity of the line, and would be altogether illusory upon any other hypothesis. I have discussed elsewhere the statements of this edict and their stichometric value.[4] It is only necessary, therefore, to give a brief recapitulation of the points thereby established. The edict from which the data are supplied is found in greater or less completeness in many localities, but the most important form is presented in an inscription from Stratonice; the figures being edited in the Corpus Inscriptionum from another inscription found in Phrygia. We have then:

Membranario in [qua]t[r]endone pedali pergamena.	[XL denarii]
Scriptori in scriptura optima versus No. centum.	[XXV]
Se[quentis] scripturae versuum No. centum.	[XX]
Tabellanioni in scriptura libelli vel tabular[um] in versibus No. centum.	[X]

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[1] P. 529.

[2] P. 530.

[3] Philostratus Sophist. II 10, p. 185, quoted by Wachsmuth, Rhein. Mus. 34, 1879, p. 481.

[4] American Journal of Philology, 12, Suppl. p. 22 sqq.

It is clear from the inscription that there are at least two principal types of writing, if not a third; and in every case the measurement is by verses, no distinction being made or imagined between prose and poetry.

It is inconceivable that the difference in price should be due to a difference in the quality of the writing (as Birt suggests), for it would be somewhat difficult to graduate such uncertain things as the hands of scribes, to say nothing of dividing them exactly into good and bad; it must, therefore, be of different lengths of line that the edict speaks, *optimus* and *sequens* being the common terms all through the edict for first size and second size.

If the prices are correctly edited in the Corpus, the ratio 5 : 4 (=35 : 28) is very nearly that of the normal hexameter to the normal iambic line, 36 : 28, which confirms our previous speculations as to the existence of the iambic lines. The difficulty in all such cases is to reduce the brass denarius of Diocletian's time into an equivalent of modern money. If we may take the values given by Birt[1] from Hultsch,[2] the payment is sufficiently small; 100 denarii being worth no more than 2.4 marks. The denarius is then .6 cent; the scribe's pay being 15 cents for a hundred hexameters and 12 cents for a hundred iambics. On this basis I have calculated the cost of production of the complete volume of which the Codex Sinaiticus forms a part; the result being approximately 180 dollars, the cost of the vellum being included.

It is not uncommon to find in early codices notes of the prices for which they were sold; Montfaucon (Bibl. Coislin. p. 57) observes that the price on the first leaf of a Psalter is γρόσα δ' = grosa sive drachmae quatuor; and at p. 83 he notes that codex 29 was bought for 24 *aspra*, the book itself being a commentary by Chrysostom on S. Paul's epistles.

A cursive MS of the Gospels (No. 444) sold in A. D. 1537 for 500 *aspra*; upon which Scrivener[3] notes that "the asper or asprum was a mediaeval Greek silver coin (derived from ἄσπρος = albus); we may infer its value from a passage cited by Ducange from Vincentius Bellovacus, XXX 75, 'quindecim drachmae seu asperos.'" Since the 4 Gospels are not more than twice as long again as the Psalms, it is difficult to see why the Psalter should sell for 4 drachmae and the Gospels for 500. And it is possible that Montfaucon's price is incorrect.

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[1] Birt, p. 209. [2] Hultsch. Neue Jahrbücher für Philologie, 1880, Heft 1.

[3] Scrivener, Introduction to N. T., p. 208.

M. Graux[1] gives us the further important information with regard to the pay of scribes, that the custom of regulating, if not the tariff, at least the measure of lines written, continued right into the middle ages, especially at Bologna and other university towns in Italy. He quotes Savigny,[2] Geschichte des Römischen Rechts im Mittelalter, to establish this point.

The unit of measure is the *pecia*, which consists of 16 columns, each containing 62 lines, and the number of letters in each line being 32. "Secundum taxationem studii bononiensis firmamus quod petia constituetur ex sedecim columnis quarum quaelibet contineat sexaginta duas lineas et quaelibet linea litteras XXXII." The numbers here are peculiar, and it is extremely difficult to believe that as many as 62 lines were normally written on the page. It is interesting, however, to observe the survival of ancient custom in the columnar writing, and the measurement of lines by letters. The statute is, therefore, in all probability the relic and modification of previous laws.

Whether the line of 32 letters has any reference to the Italian poetry, as Birt suggests, is extremely doubtful. It is more likely to have been suggested as a multiple of the favorite number 16. We have no reason to suppose that such a statute as that mentioned required that MSS should actually be copied in columns or lines of the pattern indicated; all that was necessary was the adoption of this unit as the standard, and the record by the scribe of the number of peciae. M. Graux remarks that these notes of the scribe as to the progress of his work, "finis pecie I," are sometimes found in the body of the pages or the text.

Upon the whole, I am inclined to believe that the text of the statute is incorrect in reading sixty-two lines, a most improbable number. If we read 72 for 62, the pecia is almost exactly 1000 hexameters of 36 letters each; strictly speaking it is 1024. And this is an extremely likely unit of work to have been handed down by tradition from the early scribes.

An interesting survival of this early manner of determining the pay of a scribe is found in the modern custom among Indian copyists. Here the basis is the çloka, an iambic metre of 32 syl-

[1] Revue de Philologie, p. 139.

[2] T. III, c. xxv, §579.

lables, which is applied as a unit of measurement to writings of all kinds.[1]

We shall now turn our attention to the bearing which these results have upon the restoration of the early book-form, and in particular upon the texts of the New Testament. Thus far we have avoided almost entirely any reference to the stichometric data supplied by Biblical MSS, because they constitute so important a factor in textual criticism that they deserve a separate discussion, and one more complete than has hitherto been accorded them. For the same reason we have reserved any allusions to Euthalius and his edition of the New Testament.

J. RENDEL HARRIS.

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[1] Note by Dr. Bloomfield in Amer. Journ. Phil. **12**, Suppl. p. 22, and remark by Gardthausen from Nöldeke, in Griech. Palaeogr. p. 132.

(*To be continued.*)